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Evolution of Loki's IR Spectrum During its 1997 Eruption from Combined NIMS and Satellite Occultation Radiometry

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We use a unique data set consisting of a combination of IR measurements from Palomar, IRTF, and Galileo NIMS to define and model the evolution of Loki's 3 to 11\mum thermal emission spectrum throughout its 1997 eruption. A series of occultations of Io by either Europa or Ganymede on 3/28, 4/11, 4/18, 6/21, 6/28, 7/5, 7/26, 8/17 and 12/10/1997 UT allow isolation of the emission from Loki in ground-based observations. SpectroCAM-10 spectra from Palomar include the critical 8-11\mum spectral region covering the peak of Loki's thermal emission. Galileo NIMS observations include Loki spectra taken during E6 (2/21), G7 (4/4) and C9 (6/28/97) that define the spectrum for wavelengths shorter than 5.2\mum. The 1997 Loki eruption is the optimum data set for this effort due to its occurrence during the Galileo Prime Mission and simultaneously during the series of satellite occultations. It is among the best observed in the number of observations available and with mid-IR spectral coverage resolving the contribution from individual hot spots. This eruption started between 2/21, when NIMS observed low 2.95\mum emission at Loki, and 3/12, when J. Spencer's monitoring program at IRTF reported strong 3.5\mum brightening. The NIMS observations in C9 show that Loki's 3.5\mum flux had faded by 6/28 to about 70% of its value during G7 on 4/4. The well-constrained starting time and the inclusion of 8-11\mum observations spanning 8 months make this data set ideal for applying eruption models that predict the evolution of the spectrum to determine physical parameters of Io's dominant hot spot. The results of these models may have important implications for understanding the close-up Loki observations with NIMS and PPR in the targeted Io encounters during orbits I24-31. This research was funded by grants from the NASA Planetary Astronomy and Jupiter System Data Analysis Programs.

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